DOCUMENT RESUME

ED 161 704 SE 025 158

AUTHOR Kobelin, Joel
TITLE Report on the Development of a Close Range Photogrammetry (CRP) Educational Technician Program (Museum and Archive Use).
PUB DATE 78
NOTE 21p.; Contains occasional light and broken type
AVAILABLE FROM Dr. Joel Kobelin, Miami-Dade Community College, North Campus, 11380 N.W. 27th Ave., Miami, Florida 33167 (no price quoted)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Curriculum Development; Higher Education; Junior Colleges; *Photography; Science Education; *Technical Education; *Visual Arts
IDENTIFIERS *Photogrammetry

ABSTRACT

A close range photogrammetry (CRP) technician training program was developed at Miami-Dade Community College and used to teach the technology to 16 students. Although the results of the study show that it is possible to teach CRP in a two-year program, the technology is too new in the United States to support a sustaining educational program. The syllabus of the courses is outlined. (BB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED161704

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Joel Kobelin

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

REPORT ON THE DEVELOPMENT OF A CLOSE RANGE PHOTOGRAMMETRY (CRP) EDUCATIONAL TECHNICIAN PROGRAM (Museum and Archive Use)

Joel Kobelin, Ed.D., Miami-Dade Community College, Miami, FL.

A two-year NSF project (1975-1977) to explore the development of a close-range photogrammetry technician program has been concluded at the Miami-Dade Community College North Campus by the Civil Engineering Technology Department.

Photogrammetry is a great untapped resource in the United States for the technical documentation of engineering, historical, archaeological, and artistic works. It is both an accurate and economical technical recording method. The significance of this photogrammetric technique is evident by its utilization in European universities and institutes.

Inquiry to date suggests that (1) no public educational institution in the United States is presently offering a close range technician photogrammetry program (2) there is a vast potential market for photogrammetry technicians among museum, archives, and other fields where accurate and economical documentation is sought.

The objectives of this project were:

(a) To provide students with skills in Close Range Photogrammetry (CRP).

(b) To develop the needed curriculum in this field.

(c) To disseminate information about CRP to the many potential users.

SE 025 158

The project included the use of a National Advisory Committee comprised of seven members. Each member was a nationally recognized expert in his field. Their areas of expertise were in Historic Preservation, Museum Research and Administration, and in Photogrammetry.

The advisory committee gave us needed input in these general areas:

(a) information on determining the need for trained technicians in close range photogrammetry.

(b) what general and specific competencies would be needed for trained technicians.

(c) provided feedback on a continuous basis to our project staff regarding the strengths and weaknesses of this program and offered suggestions concerning program revision and improvement.

We recruited sixteen students at Miami-Dade from various disciplines into this experimental program. This included a one-term introductory course in CRP to six anthropology students. These students were enrolled in our experimental courses in museum internships and in close range photogrammetry, as well as the supporting courses of their own disciplines. They also conducted a number of documentation (CRP) projects with local museums.

Five issues of a newsletter titled "Project Quarterly" were also published and distributed to potential users throughout the United States. This newsletter described our activities and disseminated information on the applications of Close Range Photogrammetry.

CONCLUSIONS AND RECOMMENDATIONS OBTAINED FROM THIS NSF PROJECT WERE:

1. The verification that CRP can be utilized by the museum community. We have had affirmative responses from the local museums which have been cooperating in joint projects with us. The successfully completed student exercises are:

   a. The Mural on the Barnett Bank.

b. a statue from the New Metropolitan Museum.

c. the "Barge" at the Vizcaya Museum.

d. the south facade, main building, Carrolton School for Girls, Coral Gables.

e. the firehouse in Coral Gables.

f. a statue at the Vizcaya Museum.

g. a piece of a lynx jaw bone from the Natural History Museum at the University of Florida.

h. a painting.

i. an Indian artifact from the Museum at the University of Florida.

j. Anderson's Corner: Miami's oldest business establishment.

2. Over 100 responses of interest have been received from around the country to our "Project Quarterly." Other published articles in addition to ours in the "Project Quarterly" newsletter also confirmed that Close Range Photogrammetry can be used in the Arts to "Fingerprint a Painting."

From the responses we have received there seems to be enough interest in the technology to continue the activities started under this project.

3. To our knowledge, CRP is not an in-house standard activity by any private company or federal/state agency. (For a technician program to be viable there should be a continuing and expanding employment demand for its graduates. This is not the case at the present time.)

Our recommendation, therefore, was that the technology is too new in the United States to support a sustaining two year technician educational program.

4. Transferrable courses in CRP with emphasis in historic preservation and archaeology should now be developed.

   An elective course in field measurements including the use of CRP has been developed at our school in cooperation with the Anthropology Department. The emphasis will be in the field of archeology. The course content will include the traditional methods of surveying, field notebook recording, map reading, and the technique of Close Range Photogrammetry. It will be offered in the spring of 1978.

5. We have demonstrated that it is possible to teach the technology in a two-year program. Ten exercises in Close Range Photogrammetry have been completed by students. The success verifies the validity of a two-year Technician program whose objectives would be to have its graduates capable of successfully using CRP to document historic sites and objects.

   Three core courses, Close Range Photogrammetry I, II, III, were developed. We have found that the student will also need supporting courses in measurement, photography, and architectural drafting. The other supporting courses would be in the student's major. The syllabus of the core (CRP) courses are:

CLOSE RANGE PHOTOGRAMMETRY I

A. INTRODUCTION

   1. Definition and Characteristics of Photogrammetry
   2. Historical Development
   3. Possibilities of Application
   4. Literature

B. ELEMENTARY PHOTOGRAMMETRY

1. Aerial Photogrammetry
2. Terrestrial Photogrammetry
3. Principle Point
4. Fiducial Marks
5. Vertical Photographs
6. Low Oblique Photograph
7. High Oblique Photograph

Binocular Vision

1. Vision
2. Depth Perception
3. Methods of Obtaining Stereoscopic Images
4. Stereoscopes
5. Floating Marks
6. Testing of Binocular Vision

C. RECTIFICATION

1. Principles
2. Plotting from a Single Photograph

D. CAMERAS & CALIBRATION

1. Types of Lens
   a. Wide Angle
   b. Superwide Angle
   c. Normal
2. Types of Cameras
3. Elements of a Metric Camera
   a. Methods of Calibration
   b. Tangential Distortion
   c. Radial Distortion

E. BASIC PRINCIPLES OF PHOTOGRAMMETRY

1. Photo Scale
2. Map Scale
3. Model Scale
4. Parallax
5. Types of Deformation
6. Overlaps
7. Side Lap
8. Parallax Formulas

F. STEREOMETRIC PLOTTING INSTRUMENTS

1. Principles of Stereo Models
2. Direct Optical Instruments
3. Optical-Mechanical Instruments
4. Mechanical Instruments

G. INNER ORIENTATION

1. General Procedure
2. Setting of the Focal Length

H. RELATIVE ORIENTATION

1. General Theory of Relative Orientation
2. Identification of Controls Phi, Omega, Kappa
3. Procedures for Elimination of Parallax

I. ABSOLUTE ORIENTATION

1. General Theory of Absolute Orientation
2. Changing the Scale of the Model
3. Identification of Leveling Points
4. Leveling Procedure for the Model
5. Combination of Scaling, Leveling and Removal of Parallax for Final Mapping

6. Model Deformation

J. MAPPING

Procedures

1. Principles
2. Types of Cameras
3. Determination of Base
4. Types of Plotting Instruments
5. Ground Control for the Models
6. Connecting Adjacent Models

Use of the Equipment

Camera

1. Shutter Control
2. Electrical Connection
3. Aperture Control
4. Interior Illumination Control
5. Leveling the Camera
6. Numbering of the Plates
7. Loading and Unloading the Film
8. Procedure for Disconnecting the Camera

Stereometric Plotter

1. Orientation Controls
2. Base Controls
3. Turning on the Instrument
4. Adjusting the Optics

General Mapping Procedures

1. Determining the Camera Stations for Large Objects (Buildings)

2. Determining the Camera Stations for Small Objects (Statues)

3. Determining the Camera Stations for a horizontal plane mapping project.

4. Control Considerations for documentation projects.

K. LABORATORY PLOTTING EXERCISES

CLOSE RANGE PHOTOGRAMMETRY II AND III

Each student would have the responsibility of completing three projects. Each project will consist of these general areas.

1. Taking the photograms
2. Developing the film
3. Plotting the manuscript
4. Documenting the project

The anticipated time allotted for each project will be four weeks.

Breakdown of Activities

I. Taking the Photograms
   - A. Reconnaissance and planning for each project
   - B. Load the film plates
   - C. Define the control configuration

II. Developing the Film
   - A. Develop and dry the film
   - B. Print pictures to help in plotting for the documentation

III. Plotting the Manuscript
   - A. Set up plotter and adjust model

B. Define model scale

C. Define map scale

D. Plot in pencil

E. Ink final manuscript

IV. Documentation

A. A report will be submitted; it will include:

Time spent in: 1. reconnaissance

2. photography

3. developing

4. plotting

B. History of Object

C. Photograms

D. Manuscript

E. Accuracy Evaluation

The grade will be based on the performance of these projects.

6. The education of users is of prime importance. However, it is debatable whether the priority should be focused on current working professionals through workshops or of prospective users now in training through curriculum in higher education.

Standard course work of documenting with Close Range Photogrammetry at different levels of university training can give a greater in-depth understanding of this discipline. It also develops a base within the educational system for further development and growth. An advantage of the workshop method is in the fact that the participants are interested potential or immediate users.

7. The applications that can be most easily expanded and have shown the greatest interest are in historic preservation and archaeology rather than the fine arts and the natural science museum fields.

   The majority of responses that we have received during the two years of this project have been from people interested in the documentation of Historic Architecture and Archaeology. This is not surprising since there is a great number of published papers and reports of work done utilizing CRP in Historic Preservation and archaeology.

   To many of the professionals in the Fine Arts and Natural Science field, CRP and its applications are virtually unknown.

8. There is a need for American demonstration projects with working museum scientists to test and report the advantages in terms of quality, time, and cost. One of the major considerations evident in our discussions with potential users is the current time-cost consideration.

   Time and costs are dependent on the:

   a. Character and magnitude of what has to be documented.
   b. Accuracy requirements of the client.
   c. Expertise of the technician on the plotting instrument.
   d. Experience of the documenting team with other similar type projects.
   e. Expertise and internal stability of the survey team.
   f. Equipment available.

9. Interdisciplinary projects in which engineering and the arts and sciences are combining efforts needed to have an incubation period for the understanding of and appreciation for the terminology, constraints and perspective of both fields.

   Close cooperation and understanding between the CRP team and the users is absolutely necessary to accomplish a successful mapping or documentation project.

10. A center using close range photogrammetry servicing historical societies, museums, state agencies, etc. should be established.

    This seems to be the next logical and sequential step. The reasons for this recommendation are:

    1. The field work in photographing the site is very fast.
    2. The laboratory part of the project can be performed at a fixed location.
    3. The photogrammetric equipment is expensive.
    4. Because the work can be done fairly fast, a great amount of work must be available to maintain the services of the survey crew and the plotting operator.
    5. There seems to be enough interest in this discipline by potential users to warrant the establishment of a center.

REFERENCES:

1. American Society of Photogrammetry: "Manual of Photogrammetry" 3rd ed. George Banta Co., Inc. Menasha, Wis. 1966.

2. Badekas, J. "Photogrammetric Surveys of Monuments and Sites" North Holland/American Elsevier Publishing Company, Inc., New York, 1975.

3. Borchers, P. "Photogrammetric Recording of Cultural Resources", National Park Service, P.N. 186. Washington, D.C.

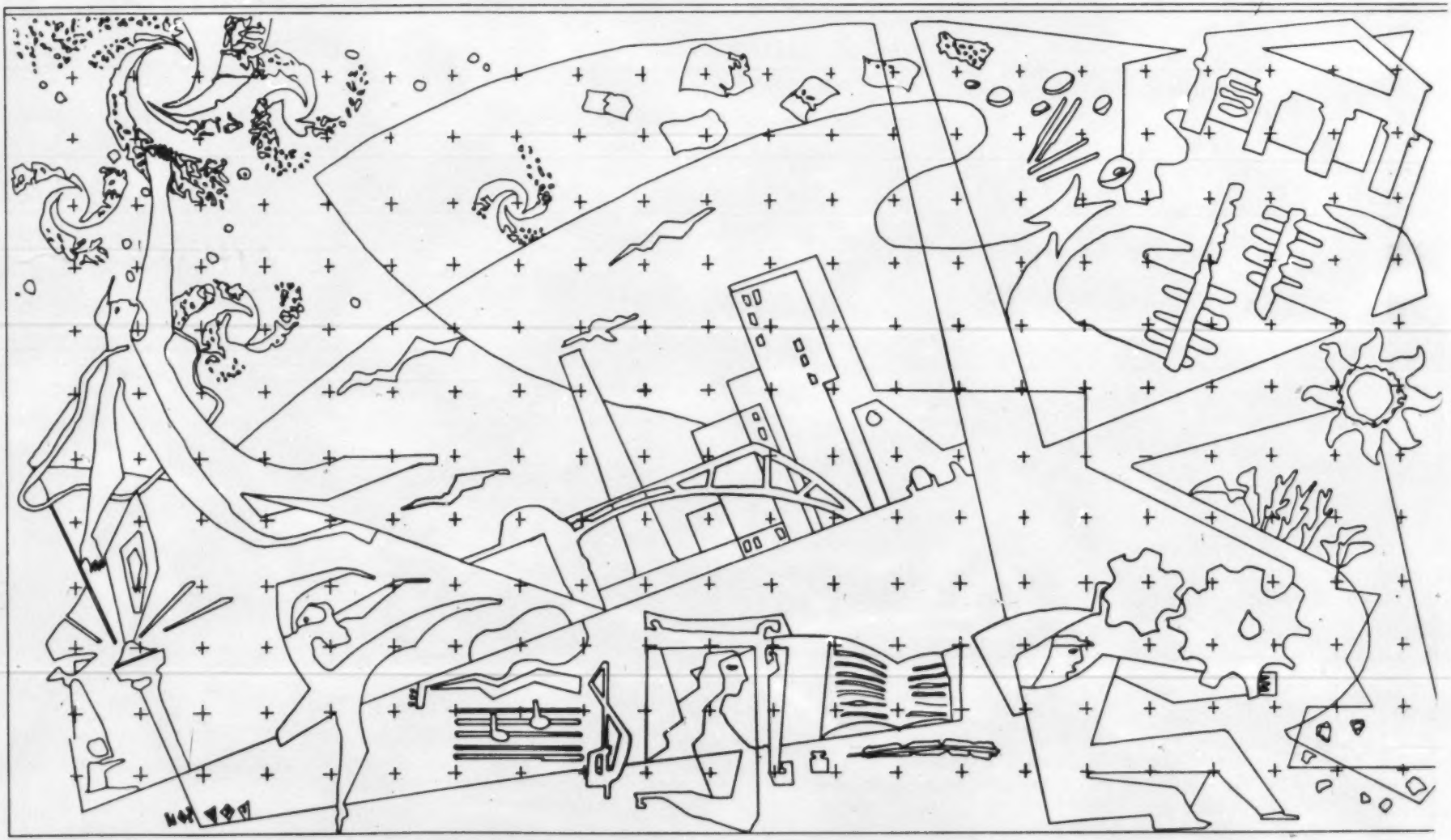
4. Church, E. and A. Quinn, "Elements of Photogrammetry," Syracuse University Press, Syracuse, N.Y. 1944.

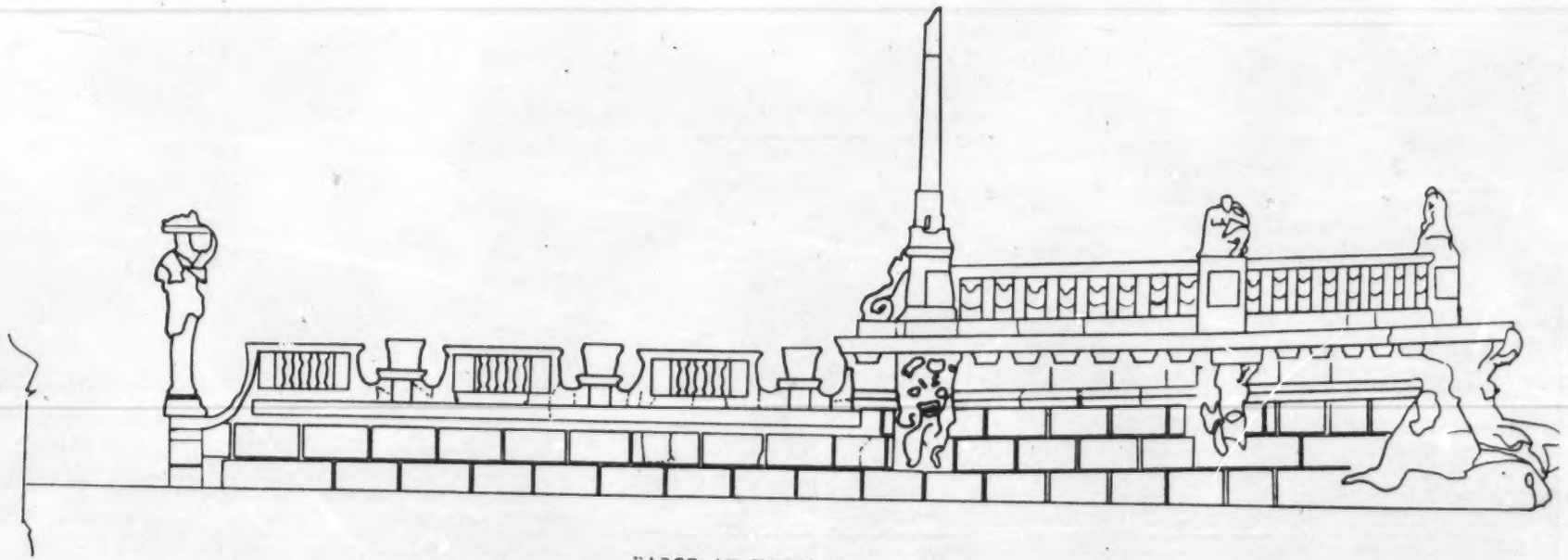
5. Hallert, B. "Photogrammetry" McGraw-Hill Book Company, New York, 1960.

6. International Committee for Architectural Photogrammetry: "Photogrammetry of Monuments and Sites", (CIPA) 2, Avenue Pasteur, F-94160, Saint-Meade, France.

7. Wolf, P.R., "Elements of Photogrammetry", McGraw-Hill Book Company, New York, 1974.

MURAL - BARNETT BANK

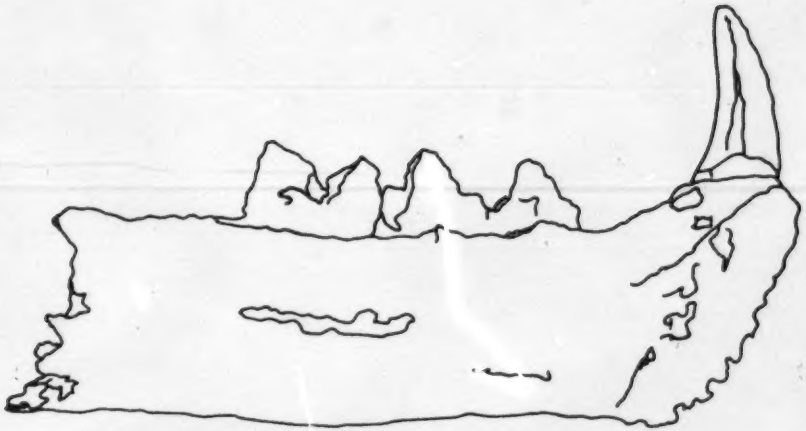




BARGE AT VIZCAYA

SOUTH FACADE—CARROLTON SCHOOL

STATUTE ON BARGE VIZCAYA	
MIAMI-DADE COMMUNITY COLLEGE	
PHOTOGRAMMETRY LAB.	
REVISIONS	
DRAWN BY J. T.	INST. JOEL KOBELIN

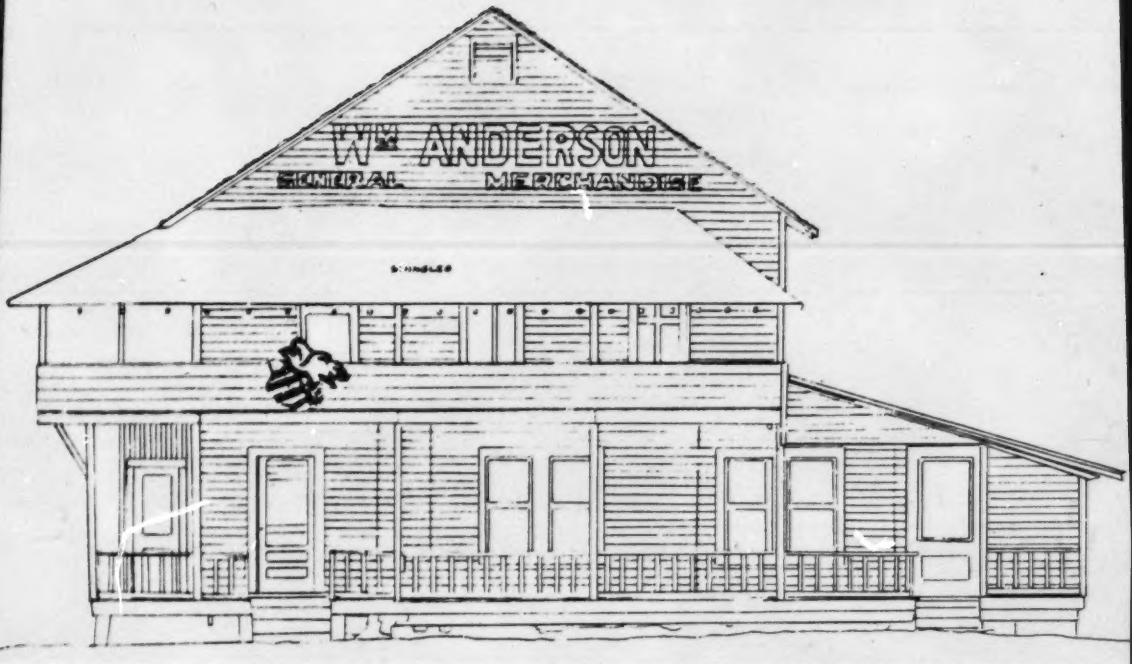


FELIS SP.-
LEFT MANDIBLE

MIAMI-DADE COMMUNITY COLLEGE
PHOTOGRAMMETRY LAB

REVISIONS:

DRAWN: JOEL KOBELIN	PR. BY: S. GILBERT
SCALE: 1 MM = 0.25 MM	DATE: APRIL 23



MIAMI-DADE COMMUNITY COLLE
PHOTOGRAMMETRY CLASS

ANDERSON'S CORNER

15800 SW 232ND STREET
MIAMI, FLORIDA